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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/622,113	POHJOLA ET AL.
	Examiner	Art Unit	
	Li Liu	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _10 September 2007_.

2a)☐ This action is **FINAL.**   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1,3-6 and 8-19_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,3-6 and 8-19_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _11/3/2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some *   c)☒ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____ .

DETAILED ACTION

Response to Amendment

1.   In view of the amendment, the Final Office Action mailed on 11 July 2007 has

been withdrawn. A new Office Action in response to the amendment is as follows.

Claim Rejections - 35 USC § 112

2.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

3.   Claims 16-19 are rejected under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

Where applicant acts as his or her own lexicographer to specifically define a term

of a claim contrary to its ordinary meaning, the written description must clearly redefine

the claim term and set forth the uncommon definition so as to put one reasonably skilled

in the art on notice that the applicant intended to so redefine that claim term. *Process

Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed.

Cir. 1999). The term "**resonance level**" in claims 16-19 is used by the claim to mean

"resonance peak (or resonance frequency, or resonance wavelength)", while the

accepted meaning of the "resonance level" is "power level or intensity level etc.", which

is different from the "resonance peak". The term is indefinite because the specification

does not clearly redefine the term.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 1, 3-6 and 8-19 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Kim et al (Kim et al: "A Low-Cost WDM Source with ASE Injected

Fabry-Perot Semiconductor Laser", IEEE Photonics Technology Letters, Vol. 12, No. 8,

August 2000, page 1067-1069) in view of Okano et al (US 6,449,074) and Obermann et

al (Obermann et al: "Performance Analysis of Wavelength Converts Based on Cross-

Gain Modulation in Semiconductor-Optical Amplifiers", Journal of Lightwave

Technology, Vol. 16, No. 1, January 1998, pages 78-85) and Zah (US 6,434,175).

        1). With regard to claim 1, Kim et al disclose an optical data transmission system

(e.g., Figures 1 and 5), comprising

        a hub (the Center Office in Figure 5);

        a kerb location (the Remote Node in Figure 5);

        a converter (the F-P SLD in Figure 5);

        an optical router (the AWG in Figure 5); and

        a plurality of optical network units (ONUs in Figure 5), wherein the ONUs include

a plurality of optically pumped sources (the F-P SLD in Figure 5), the optically pumped

sources each comprising a laser cavity (Fabry-Perot Laser cavity in Figure 5), mirrors

defining the cavity (by definition or textbook knowledge, the F-P Laser is "a laser

oscillator in which two mirrors are separated by an amplifying medium with an inverted

population, making a Fabry-Perot cavity". That is, the reflective mirrors must be present

in the F-P laser so that it can be called F-P Laser).

wherein the optical network units are configured to transmit a plurality of

respective data signals to the kerb location (Figure 5, ONUs transmit data to Remote

node),

wherein the optical router (the AWG in Figure 5) being configured to route

wavelength channels having predefined wavelength ranges assigned to respective

optical network units (the AWG slices the ASE spectral or the AWG select one lasing

mode of the F-P SLD; the wavelength of upstream data is locked to the injected ASE

wavelength) for transmission to the hub (the Center Office in Figure 5),

wherein the converter is configured to convert the data signals into the

wavelength channels (Figures 1 and 5, page 1067-1069, III DISCUSSION AND

SUMMARY).

But, in Figure 5, the wavelength converter F-P SLD is located in the ONU, not in

kerb side with the transponder; and the data signals are the electrical signals. Kim et al

does not expressly disclose (A) the laser cavity is located in the kerb; (B) wavelength

selective elements inside the cavity; and (C) the conversion being performed without

any intermediate conversion to or from an electrical signal, and wherein the data signals

comprise optical signals.

With regard to item (A) and (C), however, where to put the converter is just a

design choice; and to use optical signal to pump another gain medium for wavelength

conversion is well known and widely used in the art. Okano et al disclose an optical data

transmission system, comprising

a hub (Terminal Station 4 in Figure 1; a hub is just a common connection point

for devices in a network, and it enables signals to go from one device or segment to

another, or forwards the packet to the correct port. The Terminal Station 4 in Figure 1

does receive the optical signals from optical senders 8 via fiber 6 and forwards the

signals to the correct port optical receivers 20, therefore, it is viewed that the Terminal

Station is a hub according to the general definition of the hub.);

a kerb location (where the Transponder 10 is located, Figure 1);

a converter (Wavelength Converter 12 in Figure 1);

an optical router (Optical Multiplexer 14 in Figure 11); and

a plurality of optical network units (Optical Signal Sender 8 in Figure 1),

wherein the optical network units are configured to transmit respective data

signals to the kerb location (Optical Senders 8 output original optical signals having

arbitrary wavelengths to the Transponder 12, in Figure 1),

wherein the optical router (the Transponder 10) is configure to route wavelength

channels having predefined wavelength ranges assigned to respective optical network

units for transmission to the hub (column 4, line 8-18, wavelength converters 12 in the

transponder 10 converts the optical signals having arbitrary wavelengths from the

optical senders 8 into optical signals having predetermined wavelengths, and then the

optical multiplexer 14 in the transponder for wavelength division multiplexing the optical

signals from the wavelength converters 12 to generate WDM signal light. The WDM

signal light from the optical multiplexer 14 is output to the optical fiber transmission line

6; and then the signals are transmitted to the terminal station 4. That is, the transponder

route wavelength channels having predefined wavelength ranges assigned to

respective optical network units for transmission to the hub), and

the converter (Wavelength Converter 12 in Figure 1) is configured to convert the

data signals into the wavelength channels (column 4, line 9-13, Figure 1, wavelength

converters 12 converts the optical signals having arbitrary wavelengths from the optical

senders 8 into optical signals having predetermined wavelengths λ_1 to λ_n, respectively),

wherein the data signals are optical signals (the data signal output from the

Optical Sender is the original optical data signal, column 4 line 5-6).

Okano et al put the converter in the transponder, and the data signals are optical

signal.

But, Okano et al does not expressly discloses the conversion being performed

without any intermediate conversion to or from an electrical signal.

However, the wavelength converter performed without any O/E or E/O is well

known and has been widely used in the art. Obermann et al discloses such an all-

optical wavelength converter (Figure 1). Obermann et al teaches that an intensity

modulated input signal with the average power P_{10} at wavelength λ_1 is used to modulate

the carrier density and consequently also the gain of the SOA. Thus, the data is copied

onto a second input wave, a continuous we (CW) beam with the power P_{20} which is

placed at the desired output wavelength λ_2. The waves can be injected either co- or

counterpropagating.

So, Kim et al teaches the hub, kerb, converter, ONUs; and Okano et al further

teaches the converter can be put in the kerb location for converting the optical signal

having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths, and the data signals are optical signals; and then

Obermann et al teaches an all-optical wavelength converters.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to combine Okano's system and Obermann's all-optical

converter to the system of Kim et al so that a cost-effective WDM PON can be obtained

and the data management and signal routing can be made easier.

With regard to item (B), the combination of the Kim and Okano and Obermann et

al will put the laser cavity in kerb location or the remote node. As shown in Figure 5 of

Kim, the wavelength selective element AWG is outside the F-P laser cavity, not inside

the cavity; and the injection light from the AWG selects the resonance wavelength or

peak of each F-P laser cavity.

However, a laser cavity with the wavelength selective element inside, such as the

phasar laser, is well known and widely practice in the art. Zah teaches such a laser, a

multiwavelength laser includes a multiplexer (inside the laser cavity) for providing

wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-

10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain

sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each

comprising a laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in

Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity),

and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified

packaging and compactness, without complications, to support the DWDM applications.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the laser cavity as taught by Zah to the system of Kim et al

Okano and Obermann et al so that a compact, high wavelength accuracy and selectivity

multiwavelength laser system can be obtained.

2). With regard to claim 3, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claim 1 above. And Kim et al and

Okano et al and Obermann et al and Zah further disclose wherein the data signals are

used as pump signals to generate the wavelength channels (Okano et al: column 4, line

4-16, the original data signals pump the converter, and the converter generate the

wavelength channels having predetermined wavelengths).

3). With regard to claim 4, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claim 1 above. And Kim et al and

Okano et al and Obermann et al and Zah further disclose the original data signals have

arbitrary wavelengths. But Okano et al does not expressly state that the data signals are

within a wavelength range which does not include the wavelength or wavelengths of the

wavelength channels.

However, since Okano et al disclose that the original data signals have **arbitrary**

wavelengths (column 4, line 4-16), and the converter converts **arbitrary** wavelengths

into the wavelength channels having **predetermined** wavelengths, it is obvious that the

arbitrary wavelengths can be different from the wavelengths of the wavelength

channels (predetermined wavelengths).

4). With regard to claim 5, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claim 1 above. And Kim et al and

Okano et al and Obermann et al and Zah further disclose the wavelength channels are

generated by a plurality of optically pumped sources (Kim et al: the F-D SLD; or Okano

et al: column 4, line 9-16, the original data signals pump the converter, and the optically

pumped sources in the converter generate the wavelength channels).

5). With regard to claim 6, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claims 1 and 5 above. And Kim et al

and Okano et al and Obermann et al and Zah further disclose the optically pumped

sources generate light having different wavelengths in order to define the wavelength

channels having predefined distinct wavelength ranges (Kim et al: the wavelengths of F-

P SLD laser is determined by the center office; or Okano et al: column 4, line 9-13, the

optically pumped sources within the wavelength converters convert the optical signals

having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths λ_1 to λ_n, respectively).

6). With regard to claim 8, Kim et al and Okano et al and Obermann et al

discloses all of the subject matter as applied to claim 1 above. And Kim et al and Okano

et al and Obermann et al further disclose the optical network units (Okano et al: Optical

Senders 8 in Figure 1) output the original data signals have **arbitrary wavelengths**. But

Okano et al does not expressly state that the respective ones of the ONUs (optical

senders) are sufficiently similar that they are interchangeable.

However, since optical senders output the original data signals have arbitrary

wavelengths, it is obvious that they can be made sufficiently similar and interchangeable

(the "sufficiently similar" is the subset of the "arbitrary").

7). With regard to claim 9, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claims 1 and 5 above. And Kim et al

and Okano et al and Obermann et al and Zah further discloses wherein the optically

pumped sources are injection locked lasers (Figures 1 and 5 of Kim et al, the F-P lasers

are injection locked lasers).

8). With regard to claim 10, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claims 1, 5 and 9 above. And Kim et

al and Okano et al and Obermann et al and Zah further discloses the injection

wavelength is selected by a WDM and/or a AWG (Figures 1 and 5 of Kim et al, the

AWG is used to select the injection wavelength).

9). With regard to claim 11, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claims 1 and 5 above. And Kim et al

and Okano et al and Obermann et al and Zah further disclose wherein the optically

pumped sources are external cavity lasers (Figure 1 of Zah, the multiwaelength phasar

laser is a external cavity laser).

10). With regard to claim 12, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claims 1, 5, 9 and 10 above. And

Kim et al and Okano et al and Obermann et al and Zah further disclose wherein the

optical router is within the laser cavity of at least one optically pumped source (Figure 1

of Zah, the optical router or multiplexer 320 is within the laser cavity).

11). With regard to claim 13, Kim et al and Okano et al and Obermann et al and

Zah disclose all of the subject matter as applied to claim 1 above. But Okano et al does

not expressly states wherein the pumping light is at a wavelength different to the

wavelength of light which is used to carry data traffic in upstream and downstream

directions.

However, since Okano et al disclose that the original data signals have **arbitrary**

wavelengths (column 4, line 4-16), and the converter converts **arbitrary** wavelengths

into the wavelength channels having **predetermined** wavelengths, it is obvious that the

arbitrary wavelengths can be different from the wavelengths of the wavelength

channels (predetermined wavelengths). In Figures 1 and 5 of Kim et al and Figure 1 of

Okano et al, an upstream signal transmission is shown. However, the bi-directional

WDM system has been widely used in the passive optical network. Therefore, it would

have been obvious to one of ordinary skill in the art at the time the invention was made

to apply the bi-directional data transmission as widely used in the art to the system of

Kim et al and Okano et al and make the wavelength of the original optical signal

different from the wavelengths of both upstream and downstream directions, so that the

system cost can be reduced by the bi-directional transmission, and system

management can be made easy by using different wavelengths for the original data

signal and the upstream and downstream signals.

12). With regard to claim 14, Kim et al and Okano et al and Obermann et al and Zah disclose all of the subject matter as applied to claim 1 above. And Kim et al and Okano et al and Obermann et al and Zah further disclose wherein the optical router is a WDM (Kim et al: the AWG in Figures 1 and 5; or Okano et al: Optical Multiplexer 14 in Figure 1, column 4, line 15-17).

13). With regard to claim 15, Kim et al and Okano et al and Obermann et al and Zah disclose all of the subject matter as applied to claim 1 above. And Kim et al and Okano et al and Obermann et al and Zah further wherein the optical router is an arrayed waveguide grating (Kim et al: the AWG in Figures 1 and 5).

14). With regard to claim 16, Kim et al disclose a method of transmitting data (e.g., Figures 1 and 5), the method comprising:

transmitting, with an optical network unit, a plurality of respective data signals to a kerb location in an optical data transmission system (Figure 5, ONUs transmit data to Remote node); wherein the ONUs comprise a plurality of optically pumped sources (the F-P SLD in Figure 5), the optically pumped sources including laser cavities (Fabry-Perot Laser cavity in Figure 5; by definition or textbook knowledge, the F-P Laser is "a laser oscillator in which two mirrors are separated by an amplifying medium with an inverted population, making a Fabry-Perot cavity". That is, the reflective mirrors must be present in the F-P laser so that it can be called F-P Laser) configured to select a resonance peak of an incident light (the combination of the AWG and F-P Laser selects the resonance wavelength);

routing wavelength channels having predefined wavelength ranges assigned to respective optical network units (the AWG slices the ASE spectral or the AWG select one lasing mode of the F-P SLD; the wavelength of upstream data is locked to the injected ASE wavelength) for transmission to the hub (the Center Office in Figure 5) with an optical router (the AWG in Figures 1 and 5), and

converting the data signals into the wavelength channels with a converter (the F-P SLD converts the data signals into the wavelength channels, Figures 1 and 5, page 1067-1069, III DISCUSSION AND SUMMARY).

But, in Figure 5, the wavelength converter F-P SLD is located in the ONU, not in kerb side with the transponder; and the data signals are the electrical signals. Kim et al does not expressly disclose (A) the laser cavity is located in the kerb; (B) the laser cavity is configured to select a resonance peak of incident light; and (C) the conversion being performed without any intermediate conversion to or from an electrical signal, and wherein the data signals comprise optical signals.

With regard to item (A) and (C), however, where to put the converter is just a design choice; and to use optical signal to pump another gain medium for wavelength conversion is well known and widely used in the art. Okano et al disclose a method of transmitting data, comprising

transmitting with an optical network units (Optical Senders 8 in Figure 1), respective data signal to the kerb location in an optical data transmission system (where the Transponder is located, column 4, line 4-8, Optical Senders 8 output original optical signals having arbitrary wavelengths to the transponder 12, in Figure 1); and

routing wavelength channels having predefined wavelength ranges assigned to respective optical network units for transmission to a hub with an optical router (column 4, line 8-18, wavelength converters 12 in the transponder 10 converts the optical signals having arbitrary wavelengths from the optical senders 8 into optical signals having predetermined wavelengths, and then the optical multiplexer 14 in the transponder for wavelength division multiplexing the optical signals from the wavelength converters 12 to generate WDM signal light. The WDM signal light from the optical multiplexer 14 is output to the optical fiber transmission line 6; and then the signals are transmitted to the terminal station 4. That is, the transponder route wavelength channels having predefined wavelength ranges assigned to respective optical network units for transmission to the hub); and,

the converter (Wavelength Converter 12 in Figure 1) converting the data signals into the wavelength channels with a converter, wherein the data signals are optical signals (column 4, line 9-13, Figure 1, wavelength converters 12 converts the optical signals having arbitrary wavelengths from the optical senders 8 into optical signals having predetermined wavelengths λ_1 to λ_n, respectively).

Okano et al put the converter in the transponder, and the data signals are optical signal.

But, Okano et al does not expressly discloses the conversion being performed without any intermediate conversion to or from an electrical signal.

However, the wavelength converter performed without any O/E or E/O is well known and has been widely used in the art. Obermann et al discloses such an all-

optical wavelength converter (Figure 1). Obermann et al teaches that an intensity

modulated input signal with the average power P_{10} at wavelength λ_1 is used to modulate

the carrier density and consequently also the gain of the SOA. Thus, the data is copied

onto a second input wave, a continuous we (CW) beam with the power P_{20} which is

placed at the desired output wavelength λ_2. The waves can be injected either co- or

counterpropagating.

So, Kim et al teaches the hub, kerb, converter, ONUs; and Okano et al further

teaches the converter can be put in the kerb location for converting the optical signal

having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths, and the data signals are optical signals; and then

Obermann et al teaches an all-optical wavelength converters.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to combine Okano's method and Obermann's all-optical

converter to the system and method of Kim et al so that a cost-effective WDM PON can

be obtained and the data management and signal routing can be made easier.

With regard to item (B), the combination of the Kim and Okano and Obermann et

al will put the laser cavity in kerb location or the remote node. As shown in Figure 5 of

Kim, the wavelength selective element AWG is outside the F-P laser cavity, not inside

the cavity; and the injection light from the AWG selects the resonance wavelength or

peak of each F-P laser cavity.

However, a laser cavity with the wavelength selective element inside, such as the

phasar laser, is well known and widely practice in the art. Zah teaches such a laser, a

multiwavelength laser includes a multiplexer (inside the laser cavity) for providing

wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-

10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain

sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each

comprising a laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in

Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity),

and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified

packaging and compactness, without complications, to support the DWDM applications.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the laser cavity as taught by Zah to the system of Kim et al

Okano and Obermann et al so that a compact, high wavelength accuracy and selectivity

multiwavelength laser system can be obtained.

15). With regard to claim 17, Kim et al disclose an optical router for an optical

data transmission system (e.g., Figures 1 and 5), the optical data transmission system

comprising

a hub (the Center Office in Figure 5);

a kerb location (the Remote Node in Figure 5), and

a plurality of optical network units (ONUs in Figure 5), the optical network units

being configured to transmit a plurality of respective data signals to the kerb location

(Figure 5, ONUs transmit data to Remote node); wherein the ONUs comprise a plurality

of optically pumped sources (the F-P SLD in Figure 5), the optically pumped sources

including laser cavities (Fabry-Perot Laser cavity in Figure 5, by definition or textbook

knowledge, the F-P Laser is "a laser oscillator in which two mirrors are separated by an

amplifying medium with an inverted population, making a Fabry-Perot cavity". That is,

the reflective mirrors must be present in the F-P laser so that it can be called F-P Laser)

configured to select a resonance peak of an incident light (the combination of the AWG

and F-P Laser selects the resonance wavelength);

the optical router (the AWG in Figure 5) being configured to route wavelength

channels having predefined wavelength ranges assigned to respective optical network

units (the AWG slices the ASE spectral or the AWG select one lasing mode of the F-P

SLD; the wavelength of upstream data is locked to the injected ASE wavelength) for

transmission to the hub (the Center Office in Figure 5),

wherein the converter being configure to convert the data signals into the

wavelength channels (Figures 1 and 5, page 1067-1069, III DISCUSSION AND

SUMMARY).

But, in Figure 5, the wavelength converter F-P SLD is located in the ONU, not in

kerb side with the transponder; and the data signals are the electrical signals. Kim et al

does not expressly disclose (A) the laser cavity is located in the kerb; (B) the laser

cavity is configured to select a resonance peak of incident light; and (C) the conversion

being performed without any intermediate conversion to or from an electrical signal, and

wherein the data signals comprise optical signals.

With regard to item (A) and (C), however, where to put the converter is just a

design choice; and to use optical signal to pump another gain medium for wavelength

conversion is well known and widely used in the art. Okano et al disclose an optical

data transmission system, comprising

a hub (Terminal Station 4 in Figure 1; a hub is just a common connection point

for devices in a network, and it enables signals to go from one device or segment to

another, or forwards the packet to the correct port. The Terminal Station 4 in Figure 1

does receive the optical signals from optical senders 8 via fiber 6 and forwards the

signals to the correct port optical receivers 20, therefore, it is viewed that the Terminal

Station is a hub according to the general definition of the hub.);

a kerb location (where the Transponder 10 is located, Figure 1);

a converter (Wavelength Converter 12 in Figure 1);

an optical router (Optical Multiplexer 14 in Figure 11); and

a plurality of optical network units (Optical Signal Sender 8 in Figure 1),

wherein the optical network units are configured to transmit respective data

signals to the kerb location (Optical Senders 8 output original optical signals having

arbitrary wavelengths to the Transponder 12, in Figure 1),

wherein the optical router (the Transponder 10) is configure to route wavelength

channels having predefined wavelength ranges assigned to respective optical network

units for transmission to the hub (column 4, line 8-18, wavelength converters 12 in the

transponder 10 converts the optical signals having arbitrary wavelengths from the

optical senders 8 into optical signals having predetermined wavelengths, and then the

optical multiplexer 14 in the transponder for wavelength division multiplexing the optical

signals from the wavelength converters 12 to generate WDM signal light. The WDM

signal light from the optical multiplexer 14 is output to the optical fiber transmission line

6; and then the signals are transmitted to the terminal station 4. That is, the transponder

route wavelength channels having predefined wavelength ranges assigned to

respective optical network units for transmission to the hub), and

the converter (Wavelength Converter 12 in Figure 1) is configured to convert the

data signals into the wavelength channels (column 4, line 9-13, Figure 1, wavelength

converters 12 converts the optical signals having arbitrary wavelengths from the optical

senders 8 into optical signals having predetermined wavelengths λ_1 to λ_n, respectively),

wherein the data signals are optical signals (the data signal output from the

Optical Sender is the original optical data signal, column 4 line 5-6).

Okano et al put the converter in the transponder, and the data signals are optical

signal.

But, Okano et al does not expressly discloses the conversion being performed

without any intermediate conversion to or from an electrical signal.

However, the wavelength converter performed without any O/E or E/O is well

known and has been widely used in the art. Obermann et al discloses such an all-

optical wavelength converter (Figure 1). Obermann et al teaches that an intensity

modulated input signal with the average power P_{10} at wavelength λ_1 is used to modulate

the carrier density and consequently also the gain of the SOA. Thus, the data is copied

onto a second input wave, a continuous we (CW) beam with the power P_{20} which is

placed at the desired output wavelength λ_2. The waves can be injected either co- or

counterpropagating.

So, Kim et al teaches the hub, kerb, converter, ONUs; and Okano et al further

teaches the converter can be put in the kerb location for converting the optical signal

having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths, and the data signals are optical signals; and then

Obermann et al teaches an all-optical wavelength converters.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to combine Okano's system and Obermann's all-optical

converter to the system of Kim et al so that a cost-effective WDM PON can be obtained

and the data management and signal routing can be made easier.

With regard to item (B), the combination of the Kim and Okano and Obermann et

al will put the laser cavity in kerb location or the remote node. As shown in Figure 5 of

Kim, the wavelength selective element AWG is outside the F-P laser cavity, not inside

the cavity; and the injection light from the AWG selects the resonance wavelength or

peak of each F-P laser cavity.

However, a laser cavity with the wavelength selective element inside, such as the

phasar laser, is well known and widely practice in the art. Zah teaches such a laser, a

multiwavelength laser includes a multiplexer (inside the laser cavity) for providing

wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-

10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain

sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each

comprising a laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in

Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity),

and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified

packaging and compactness, without complications, to support the DWDM applications.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the laser cavity as taught by Zah to the system of Kim et al

Okano and Obermann et al so that a compact, high wavelength accuracy and selectivity

multiwavelength laser system can be obtained.

16). With regard to claim 18, Kim et al disclose a converter for an optical data

transmission system (e.g., Figures 1 and 5) comprising

a hub (the Center Office in Figure 5);

a kerb location (the Remote Node in Figure 5),

an optical router (the AWG in Figure 5); and

a plurality of optical network units (ONUs in Figure 5), the optical network units

being configured to transmit a plurality of respective data signals to the kerb location

(Figure 5, ONUs transmit data to Remote node), wherein the ONUs comprise a plurality

of optically pumped sources (the F-P SLD in Figure 5), the optically pumped sources

including laser cavities (Fabry-Perot Laser cavity in Figure 5; by definition or textbook

knowledge, the F-P Laser is "a laser oscillator in which two mirrors are separated by an

amplifying medium with an inverted population, making a Fabry-Perot cavity". That is,

the reflective mirrors must be present in the F-P laser so that it can be called F-P Laser)

configured to select a resonance peak of an incident light (the combination of the AWG

and F-P Laser selects the resonance wavelength);

the converter being configure to convert the data signals into the wavelength

channels having predetermined wavelength ranges assigned to respective optical

network units (the wavelength of upstream data is locked to the injected ASE

wavelength, Figures 1 and 5, page 1067-1069, III DISCUSSION AND SUMMARY).

the optical router (the AWG in Figure 5) being configured to route the wavelength

channels (the AWG slices the ASE spectral or the AWG select one lasing mode of the

F-P SLD; the wavelength of upstream data is locked to the injected ASE wavelength) for

transmission to the hub (the Center Office in Figure 5).

But, in Figure 5, the wavelength converter F-P SLD is located in the ONU, not in

kerb side with the transponder; and the data signals are the electrical signals. Kim et al

does not expressly disclose (A) the laser cavity is located in the kerb; (B) the laser

cavity is configured to select a resonance peak of incident light; and (C) the conversion

being performed without any intermediate conversion to or from an electrical signal, and

wherein the data signals comprise optical signals.

With regard to item (A) and (C), however, where to put the converter is just a

design choice; and to use optical signal to pump another gain medium for wavelength

conversion is well known and widely used in the art. Okano et al disclose an optical

data transmission system, comprising

a hub (Terminal Station 4 in Figure 1; a hub is just a common connection point

for devices in a network, and it enables signals to go from one device or segment to

another, or forwards the packet to the correct port. The Terminal Station 4 in Figure 1

does receive the optical signals from optical senders 8 via fiber 6 and forwards the

signals to the correct port optical receivers 20, therefore, it is viewed that the Terminal

Station is a hub according to the general definition of the hub.);

      a kerb location (where the Transponder 10 is located, Figure 1);

      a converter (Wavelength Converter 12 in Figure 1);

      an optical router (Optical Multiplexer 14 in Figure 11); and

      a plurality of optical network units (Optical Signal Sender 8 in Figure 1),

      wherein the optical network units are configured to transmit respective data

signals to the kerb location (Optical Senders 8 output original optical signals having

arbitrary wavelengths to the Transponder 12, in Figure 1),

      wherein the optical router (the Transponder 10) is configure to route wavelength

channels having predefined wavelength ranges assigned to respective optical network

units for transmission to the hub (column 4, line 8-18, wavelength converters 12 in the

transponder 10 converts the optical signals having arbitrary wavelengths from the

optical senders 8 into optical signals having predetermined wavelengths, and then the

optical multiplexer 14 in the transponder for wavelength division multiplexing the optical

signals from the wavelength converters 12 to generate WDM signal light. The WDM

signal light from the optical multiplexer 14 is output to the optical fiber transmission line

6; and then the signals are transmitted to the terminal station 4. That is, the transponder

route wavelength channels having predefined wavelength ranges assigned to

respective optical network units for transmission to the hub), and

the converter (Wavelength Converter 12 in Figure 1) is configured to convert the

data signals into the wavelength channels (column 4, line 9-13, Figure 1, wavelength

converters 12 converts the optical signals having arbitrary wavelengths from the optical

senders 8 into optical signals having predetermined wavelengths λ_1 to λ_n, respectively),

wherein the data signals are optical signals (the data signal output from the

Optical Sender is the original optical data signal, column 4 line 5-6).

Okano et al put the converter in the transponder, and the data signals are optical

signal.

But, Okano et al does not expressly discloses the conversion being performed

without any intermediate conversion to or from an electrical signal.

However, the wavelength converter performed without any O/E or E/O is well

known and has been widely used in the art. Obermann et al discloses such an all-

optical wavelength converter (Figure 1). Obermann et al teaches that an intensity

modulated input signal with the average power P_{10} at wavelength λ_1 is used to modulate

the carrier density and consequently also the gain of the SOA. Thus, the data is copied

onto a second input wave, a continuous we (CW) beam with the power P_{20} which is

placed at the desired output wavelength λ_2. The waves can be injected either co- or

counterpropagating.

So, Kim et al teaches the hub, kerb, converter, ONUs; and Okano et al further

teaches the converter can be put in the kerb location for converting the optical signal

having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths, and the data signals are optical signals; and then

Obermann et al teaches an all-optical wavelength converters.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to combine Okano's system and Obermann's all-optical

converter to the system of Kim et al so that a cost-effective WDM PON can be obtained

and the data management and signal routing can be made easier.

With regard to item (B), the combination of the Kim and Okano and Obermann et

al will put the laser cavity in kerb location or the remote node. As shown in Figure 5 of

Kim, the wavelength selective element AWG is outside the F-P laser cavity, not inside

the cavity; and the injection light from the AWG selects the resonance wavelength or

peak of each F-P laser cavity.

However, a laser cavity with the wavelength selective element inside, such as the

phasar laser, is well known and widely practice in the art. Zah teaches such a laser, a

multiwavelength laser includes a multiplexer (inside the laser cavity) for providing

wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-

10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain

sources (e.g., the optical gain medium 118 in Figure 1), the optical gain sources each

comprising a laser cavity (laser cavity 142 is formed by the mirror 136 and facet 332 in

Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity),

and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified

packaging and compactness, without complications, to support the DWDM applications.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the laser cavity as taught by Zah to the system of Kim et al

Okano and Obermann et al so that a compact, high wavelength accuracy and selectivity

multiwavelength laser system can be obtained.

17). With regard to claim 19, Kim et al disclose an optical data transmission

system (e.g., Figures 1 and 5), comprising:

transmitting means for transmitting, with an the optical network unit, a plurality of

respective data signals to a kerb location (Figure 5, ONUs transmit data to Remote

node), wherein the ONUs comprise a plurality of optically pumped sources (the F-P SLD

in Figure 5), the optically pumped sources including laser cavities (Fabry-Perot Laser

cavity in Figure 5; by definition or textbook knowledge, the F-P Laser is "a laser

oscillator in which two mirrors are separated by an amplifying medium with an inverted

population, making a Fabry-Perot cavity". That is, the reflective mirrors must be present

in the F-P laser so that it can be called F-P Laser) configured to select a resonance

peak of an incident light (the combination of the AWG and F-P Laser selects the

resonance wavelength);

routing means (the AWG in Figure 5) for routing wavelength channels having

predefined wavelength ranges assigned to respective optical network units (the AWG

slices the ASE spectral or the AWG select one lasing mode of the F-P SLD; the

wavelength of upstream data is locked to the injected ASE wavelength) for transmission

to the hub (the Center Office in Figure 5) with an optical router (the AWG in Figures 1

and 5), and

converting means for converting the data signals into the wavelength channels
with a converter (the F-P SLD converts the data signals into the wavelength channels,
Figures 1 and 5, page 1067-1069, III DISCUSSION AND SUMMARY).

But, in Figure 5, the wavelength converter F-P SLD is located in the ONU, not in
kerb side with the transponder; and the data signals are the electrical signals. Kim et al
does not expressly disclose (A) the laser cavity is located in the kerb; and the laser
cavity is configured to select a resonance peak of incident light; and (C) the conversion
being performed without any intermediate conversion to or from an electrical signal.

With regard to item (A) and (C), however, where to put the converter is just a
design choice; and to use optical signal to pump another gain medium and et
wavelength conversion is well known and widely used in the art. Okano et al disclose
an optical data transmission system, comprising

transmitting means (optical sender 8 in Figure 1) for transmitting, with an optical
network units (Optical Senders 8 in Figure 1), respective data signal to the kerb location
(where the Transponder is located, column 4, line 4-8, Optical Senders 8 output original
optical signals having arbitrary wavelengths to the transponder 12, in Figure 1); and

routing means (the Multiplexer 14 in Figure 1) for routing wavelength channels
having predefined wavelength ranges assigned to respective optical network units for
transmission to a hub with an optical router (column 4, line 8-18, wavelength converters
12 in the transponder 10 converts the optical signals having arbitrary wavelengths from
the optical senders 8 into optical signals having predetermined wavelengths, and then
the optical multiplexer 14 in the transponder for wavelength division multiplexing the

optical signals from the wavelength converters 12 to generate WDM signal light. The

WDM signal light from the optical multiplexer 14 is output to the optical fiber

transmission line 6; and then the signals are transmitted to the terminal station 4. That

is, the transponder route wavelength channels having predefined wavelength ranges

assigned to respective optical network units for transmission to the hub); and,

converting means (Wavelength Converter 12 in Figure 1) for converting the data

signals into the wavelength channels with a converter, wherein the data signals are

optical signals (column 4, line 9-13, Figure 1, wavelength converters 12 converts the

optical signals having arbitrary wavelengths from the optical senders 8 into optical

signals having predetermined wavelengths λ_1 to λ_n, respectively).

Okano et al put the converter in the transponder, and the data signals are optical

signal.

But, Okano et al does not expressly discloses the conversion being performed

without any intermediate conversion to or from an electrical signal.

However, the wavelength converter performed without any O/E or E/O is well

known and has been widely used in the art. Obermann et al discloses such an all-

optical wavelength converter (Figure 1). Obermann et al teaches that an intensity

modulated input signal with the average power P_{10} at wavelength λ_1 is used to modulate

the carrier density and consequently also the gain of the SOA. Thus, the data is copied

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placed at the desired output wavelength λ_2. The waves can be injected either co- or

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So, Kim et al teaches the hub, kerb, converter, ONUs; and Okano et al further

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having arbitrary wavelengths from the optical senders into optical signals having

predetermined wavelengths, and the data signals are optical signals; and then

Obermann et al teaches an all-optical wavelength converters.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to combine Okano's method and Obermann's all-optical

converter to the system and method of Kim et al so that a cost-effective WDM PON can

be obtained and the data management and signal routing can be made easier.

With regard to item (B), the combination of the Kim and Okano and Obermann et

al will put the laser cavity in kerb location or the remote node. As shown in Figure 5 of

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multiwavelength laser includes a multiplexer (inside the laser cavity) for providing

wavelength accuracy and reflectors for forming laser cavity (Figure 1, column 2, line 5-

10, and column 3 line 58 to column 4 line 34). Zah teaches a plurality of optical gain

sources (e.g., the optical gain medium 118 in Figure 1); the optical gain sources each

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Figure 1), mirrors defining the cavity (the mirror 136 and facet 332 define the cavity),

and wavelength selective elements (the phasar multiplexer 320 inside the cavity).

Zah provide laser with a high wavelength accuracy and selectivity, simplified

packaging and compactness, without complications, to support the DWDM applications.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the laser cavity as taught by Zah to the system of Kim et al

Okano and Obermann et al so that a compact, high wavelength accuracy and selectivity

multiwavelength laser system can be obtained.

Conclusion

6.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

Doerr et al (US 6,240,118).

7.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Li Liu whose telephone number is (571)270-1084. The

examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
September 14, 2007

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